Curriculum Vitae   Joseph L. Shomberg, Ph.D.

Personal and Contact Information

Born in Wisconsin Rapids, WI (USA) on December 16, 1974
Citizenship: United States of America
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Education

University of Wisconsin – Milwaukee

Ph.D., Mathematics   Completion date: August, 2008
Dissertation Title: Explicit Construction of a Robust Family of Compact Inertial Manifolds
Adviser: Professor Albert J. Milani
M.S., Mathematics   May, 2002

University of Wisconsin – Stevens Point

B.A., Mathematics and Philosophy (double major)   December, 1999

University of Wisconsin Center – Marshfield/Wood County

Associate of Arts and Science   May, 1996

Academic Employment History

Providence College

Associate Professor (with tenure)   July, 2014—current

- Teaching centric duties; didactical meditations
- Research
- Service to the discipline, to the college and to the department

Assistant Professor   July, 2009—June, 2014
Adjunct Assistant Professor   September, 2008—June, 2009

Courses taught:

- MTH 105 Introduction to Mathematical Methods
- MTH 107 Mathematics for Business Analysis I
- MTH 108 Mathematics for Business Analysis II
- MTH 109 Calculus I
- MTH 110 Calculus II
- MTH 131 Calculus and Analytical Geometry I
- MTH 132 Calculus and Analytical Geometry II
- MTH 215 Linear Algebra
- MTH 223 Calculus and Analytical Geometry III
- MTH 304 Differential Equations
- MTH 311/506 History of Mathematics (formerly MTH 435) (eight weeks as substitute)
- MTH 318 (formerly MTH 417) Topics in Applied Mathematics
- CSC/MTH 320 Numerical Analysis (formerly CSC/MTH 440 Numerical Analysis I)
- MTH 390 Independent Study: Dynamical Systems and Chaos
- MTH 390 Independent Study: PDE in Medical Imaging
- MTH 540 Topics in Applied Math: Lebesgue Integration and Fourier Series
- MTH 537 Topics in Complex Variables (designed the course but did not teach it because of a medical leave)

University of Wisconsin – Milwaukee

Teaching Assistant and Dissertator   September, 2007—August, 2008
- Ph.D. research
- Teaching (sole instructor)
- Proctor for "Calculus Gateway" testing center—this was a testing center for calculus students—duties included administering and grading computer generated quizzes; also, proctoring for "Algebra Gateway" testing center, which was similar to the Calculus Gateway, but for remedial algebra students

Teaching Fellow   June, 2003—August, 2007
- Ph.D. research
- Analysis/PDE seminar presenter
- Ph.D. course work
- Teaching (sole instructor, fall semesters only)
- Proctor for Calculus Gateway testing center

Teaching Assistant   January, 2000—May, 2003
- M.S. course work
- Teaching (sole instructor)
- Proctor for Calculus Gateway testing center
- Grader/aid for two courses: taking attendance, collecting and grading homework and exams, answering student questions

Summary of teaching experience at the University of Wisconsin—Milwaukee:
- 526 students in 21 courses ranging from Intermediate Algebra, Calculus with Precalculus I & II and Calculus and Analytical Geometry I

Research Interests

- PDE arising from mathematical physics
- Dynamic boundary conditions
- Nonlocal diffusion
- Asymptotic behavior
- Finite dimensional attractors
- Infinite-dimensional dynamical systems
- Singular perturbation theory
- Numerical methods and analysis
- Approximation, experiment, illustration of finite dimensional dynamical systems

Research Statement

I am a mathematician who studies the well-posedness and stability of the infinite-dimensional dynamical systems related to phenomena in materials science. Generally, I am interested in all aspects of partial differential equations that arise in mathematical physics, in particular, those related to acoustics, heat transfer, phase transitions and viscoelasticity. Fundamentally, we must first be concerned with well-posedness: the existence of unique global in time solutions and the formulation of a dynamical system. Provided that we obtain well-posedness for the equations involved in modeling some material, we may entertain several important inquiries related to the nature of the long term behavior of the solutions—this is the end state of the dynamical system. Solutions to dissipative partial differential equations tend to an attracting set over time. This set may consist of only a single point or possess a more complicated fractal like structure. Other important issues here are the regularity and the stability of the solutions and the attractor. In many ways, dynamical systems providing regularity are easier to work with, and a stable dynamical system will exhibit a certain kind of control with respect to changes/perturbations to the underlying equation(s). Some of the most important features that are currently changing the landscape in partial differential equations are dynamic boundary conditions, memory, and fractional/nonlocal diffusion. Of these, fractional diffusion is perhaps the most important in the sense that it pervades not only the equations in mathematical physics directly, but it may also appear in extensions of these equations that rely on memory effects and/or realistic dynamic boundary conditions. For problems described by this later case, little is currently known, and it is where I now focus my research efforts.

Research Awards

Summer Scholar Program Award   Summer, 2013
>An award granted by the School of Arts and Science of Providence College to "support faculty research efforts during the summer months."

Morris and Miriam Marden Award in Mathematics   May, 2003
>A research award given to graduate students by the Department of Mathematical Sciences of the University of Wisconsin – Milwaukee in recognition of "a paper of relatively high quality with respect to both exposition and mathematical content."

Travel Grants

National Science Foundation travel grant NSF DMS-1024497   July, 2012

Fellowships

GAANN (Graduate Assistance in Areas of National Need)   June, 2003—August, 2007
>Funded by the U.S. Department of Education and awarded by the Department of Mathematical Sciences, University of Wisconsin – Milwaukee.

Chancellor's Fellowship Award   fall, 2003—spring, 2006
>The Department of Mathematical Sciences of the University of Wisconsin—Milwaukee, awarded this fellowship for tuition assistance and as a supplement to other support.

Refereed Publications

Journal Articles

1. **Joseph L. Shomberg**, On the Upper Semicontinuity of Global Attractors for Damped Wave Equations, *AIMS Mathematics* (Publisher: AIMS Press), 2 (2017), Issue 3, 557-561; DOI:10.3934/Math.2017.2.557
2. **Joseph L. Shomberg**, Exponential Decay Results for Semilinear Parabolic PDE with C^0 Potentials: A "Mean Value" Approach, *Differential Equations and Dynamical Systems* (Publisher: Springer), (2016), 1-16; DOI:10.1007/s12591-016-0274-1
3. P. Jameson Graber and **Joseph L. Shomberg**, Attractors for Strongly Damped Wave Equations with Nonlinear Hyperbolic Dynamic Boundary Conditions, *Nonlinearity* (IOP Publishing Ltd & London Mathematical Society), 29 (2016), 1171-1212; DOI:10.1088/0951-7715/29/4/1171; MR3476505
4. **Joseph L. Shomberg**, Robust Exponential Attractors for Coleman-Gurtin Equations with

Dynamic Boundary Conditions Possessing Memory, *Electronic Journal of Differential Equations* (Publisher: Texas State University, Department of Mathematics), 2016 (2016), no. 47, 1-35; MR3466518

5. Ciprian G. Gal and **Joseph L. Shomberg**, Coleman-Gurtin Type Equations with Dynamic Boundary Conditions, *Physica-D: Nonlinear Phenomena* (Publisher: Elsevier/North-Holland (Netherlands)), 292/293 (2015), 29-45; DOI:10.1016/j.physd.2014.10.008; MR3286609

6. Ciprian G. Gal and **Joseph L. Shomberg**, Hyperbolic Relaxation of Reaction Diffusion Equations with Dynamic Boundary Conditions, *Quarterly of Applied Mathematics* (Publisher: Brown University and the American Mathematical Society), 73 (2015), 93-129; DOI:10.1090/S0033-569X-2015-01363-5; MR3322727

7. **Joseph L. Shomberg**, Attractors for a Neural Network Equation, *Differential Equations and Dynamical Systems* (Publisher: Springer) 23 (2015), Issue 1, 99-115; DOI:10.1007/s12591-013-0193-3; MR3296355

8. Cristina Nartea and **Joseph L. Shomberg**, A Family of Approximate Inertial Manifolds for a Van der Pol/FitzHugh-Nagumo Perturbation Problem, *International Journal of Computer Mathematics* (Publisher: Taylor & Francis), 88 (2011), no. 7, 1443-1470; DOI:10.1080/00207160.2010.509792; MR2787903

9. **Joseph L. Shomberg**, Holomorphic Methods in PDE, *International Journal of Mathematical Analysis* 1 (2006), no. 2, 141-152; MR2295246

10. **Joseph L. Shomberg**, A Note on Surfaces with Radially Symmetric Nonpositive Gaussian Curvature, *Mathematica Bohemica* (Publisher: Institute of Mathematics, Academy of Sciences of the Czech Republic), 130 (2005), no. 2, 167-176; MR2148650

Conference Proceedings

11. **Joseph L. Shomberg**, Well-posedness and Global Attractors for a Non-isothermal Viscous Relaxation of Nonlocal Cahn-Hilliard Equations, *Nonlinear Evolution PDEs, Interfaces and Applications* (a special issue of *AIMS Mathematics*, published by AIMS Press), 1 (2016), Issue 2, 102-136; DOI:10.3934/Math.2016.2.102

Total journal impact factor = 8.8 (*AIMS Mathematics* 0.23; *Differential Equations and Dynamical Systems* 0.76; *Nonlinearity* 2.0; *Electronic Journal of Differential Equations* 0.64; *Physica-D: Nonlinear Phenomena* 1.88; *Quarterly of Applied Mathematics* 0.73; *International Journal of Computer Mathematics* 0.77; *International Journal of Mathematical Analysis* 0.49; *Mathematica Bohemica* 0.31)

"Magazine" Type Problems & Solutions

1. *American Mathematical Monthly*, Problem #11571, my name appears in "Also solved by…", January 2013 issue, volume 120, no. 1, page 83

Unpublished Papers

1. Explicit Construction of a Robust Family of Compact Inertial Manifolds; arXiv:0807.3934

Seminar Talks, Conference Presentations & Colloquia

Invited Seminar Talks (50-60 minutes)

1. "Dynamic Boundary Conditions with Memory: Well-Posedness and Attractors for Coleman-Gurtin Equations," Lefschetz Center for Dynamical Systems Seminar, Division of Applied Mathematics, Brown University, Providence, Rhode Island, March 7, 2016

Invited Conference Talks (25-30 minutes)

1. "On non-isothermal viscous nonlocal Cahn-Hilliard equations," The Second Mathematical Congress of the Americas, Special Session on Models and Methods in Evolutionary Differential Equations on mixed scales, Montréal, Canada, July 23-28, 2017; full support by Providence College
2. "Global Attractors and Weak Exponential Attractors for Strongly Damped Wave Equations with Nonlinear Hyperbolic Dynamic Boundary Conditions," The 11th American Institute of Mathematical Sciences Conference on Dynamical Systems, Special Session on Nonlinear Evolution Equations and Related Topics, Orlando, Florida, July 1-5, 2016; full support by Providence College
3. "Well-posedness and global attractors for a non-isothermal viscous relaxation of nonlocal Cahn-Hilliard equations" (Preliminary report), The 11th American Institute of Mathematical Sciences Conference on Dynamical Systems, Special Session on Qualitative and Quantitative Techniques for Differential Equations arising in Economics, Finance and Natural Sciences, Orlando, Florida, July 1-5, 2016; full support by Providence College
4. "Well-posedness and asymptotic behavior for non-isothermal viscous nonlocal Cahn-Hilliard equations" (Preliminary report), Fall Southeastern Sectional Meeting of the American Mathematical Society, Special Session on Special Session on Cahn-Hilliard and Related Equations and Applications, University of Memphis, Memphis, Tennessee,

October 17-18, 2015

5. "Attractors for Damped Semilinear Wave Equations with a Robin-Acoustic Boundary Perturbation" (Preliminary Report), Spring Eastern Sectional Meeting of the American Mathematical Society, Special Session on Nonlinear Partial Differential Equations in Sciences and Engineering, Georgetown University, Washington, DC, March 7-8, 2015

6. "Dynamic Boundary Conditions with Memory: Well-Posedness of the Coleman-Gurtin Equation," The 10th American Institute of Mathematical Sciences Conference on Dynamical Systems, Differential Equations and Applications, Special Session on Recent Advances in Evolutionary Equations, Instituto de Ciencias Matemáticas and the Universidad Autónoma de Madrid, Madrid, Spain, July 7-11, 2014; supported in part by Providence College

7. "Attractors of the Hyperbolic Relaxation of Reaction Diffusion Equations with Dynamic Boundary Conditions," The 10th American Institute of Mathematical Sciences Conference on Dynamical Systems, Differential Equations and Applications, Special Session on Nonlinear Evolution Equations and Related Topics, Instituto de Ciencias Matemáticas and the Universidad Autónoma de Madrid, Madrid, Spain, July 7-11, 2014; supported in part by Providence College

8. "Dynamic Boundary Conditions with Memory: Well-Posedness of the Coleman-Gurtin Equation" (Preliminary report), Southeastern Spring Sectional Meeting of the American Mathematical Society, Special Session on Nonlinear Partial Differential Equations in the Applied Sciences, University of Tennessee, Knoxville, Tennessee, March 21-23, 2014

9. "Attractors of the Hyperbolic Relaxation of Reaction Diffusion Equations with Dynamic Boundary Conditions," Spring Central Section Meeting of the American Mathematical Society, Special Session on Partial Differential Equations, Iowa State University, Ames, Iowa, April 27-28, 2013; supported in full by Providence College

10. "Global Attractors for Damped Semilinear Wave Equations with a Robin-Acoustic Boundary Perturbation" (Preliminary Report), The 9th American Institute of Mathematical Sciences Conference on Dynamical Systems, Differential Equations and Applications, Special Session on Singular Perturbations, Orlando, Florida, July 1-5, 2012; supported in part by Providence College and National Science Foundation travel grant NSF DMS-1024497

Contributed Talks (10-30 minute talks)

1. "Attractors for Damped Semilinear Wave Equations with a Robin-Acoustic Boundary Perturbation," EquaDiff 2015, Université Claude Bernard Lyon, Lyon, France, July 6-10, 2015; supported in part by Providence College

2. "Global Attractors of the Hyperbolic Relaxation of Reaction-Diffusion Equations with Dynamic Boundary Conditions," Society for Industrial and Applied Mathematicians

Conference on Analysis of Partial Differential Equations, Orlando, FL, December 7-10, 2013; supported in part by Providence College

3. "Attractors of the Hyperbolic Relaxation of Reaction Diffusion Equations with Dynamic Boundary Conditions," Southeastern-Atlantic Regional Conference on Differential Equations, The University of Tennessee, Knoxville, Tennessee, September 21-22, 2013; supported in full by Providence College

4. "Global Attractors for Hyperbolically Relaxed Reaction-Diffusion Equations with Dynamic Boundary Conditions," Spring Eastern Sectional Meeting of the American Mathematical Society, contributed papers sessions, Boston College, Chestnut Hill, Massachusetts, April 6-7, 2013; supported in full by Providence College

5. "On Damped Semilinear Wave Equations with Singularly Perturbed Boundary Conditions," Spring School in Nonlinear Partial Differential Equations, Université Libre de Bruxelles, Brussels, Belgium, May 30-June 6, 2012; supported in full by Providence College

6. "Global Attractors for Damped Semilinear Wave Equations with a Robin-Acoustic Boundary Perturbation" (Preliminary Report), Joint Mathematics Meetings, American Mathematical Society contributed papers sessions, Partial Differential Equations, Boston, Massachusetts, January 4-7, 2012; supported in full by Providence College

7. "Explicit Construction of a Robust Family of Compact Inertial Manifolds," Joint Mathematics Meetings, American Mathematical Society contributed papers sessions, Partial Differential Equations Washington, District of Columbia, January 5-9, 2009; supported in full by Providence College

8. "On the Problem of Prescribed Gauss Curvature," Northeast Section of the Mathematical Association of America, Bentley University, Waltham, Massachusetts November 21-22, 2008; supported in part by Providence College

9. "Harmonic Solutions to Some Fully Nonlinear PDE on R^2," Fall Central Section Meeting of the American Mathematical Society, Special Session on Geometric Partial Differential Equations, Northwestern University, Evanston, Illinois, October 23-24, 2004; supported in part by the University of Wisconsin—Milwaukee

10. "A Note on Surfaces with Radially Symmetric Nonpositive Gaussian Curvature," The Seventy-Second Annual Meeting of the Wisconsin Section of the Mathematical Association of America, University of Wisconsin—Platteville, April, 2004; supported in part by the Wisconsin Section of the Mathematical Association of America

11. "A Note on Surfaces with Radially Symmetric Nonpositive Gaussian Curvature," Mid-West Geometry Conference, University of Arkansas, Fayetteville, Arkansas, March 25-27, 2004; supported in part by the Mathematical Sciences Department of the University of Arkansas and a travel grant award from the Graduate School of the University of Wisconsin—Milwaukee

Colloquia (45-55 minutes)

1. "Harmonic Functions, Prescribed Gaussian Curvature, and Something a Little Bit Hypergeometric too!" September 28, 2011, Department of Mathematics and Computer Science Colloquium, Providence College
2. "On the Stability of Approximate Inertial Manifolds for Perturbed Ordinary Differential Equations," October 20, 2010, Department of Mathematics and Computer Science Colloquium, Providence College

Visits, Workshop & Conference Participation

Research Institute Visits

1. ICERM Summer 2018
2. Institute for Computational and Experimental Research in Mathematics (ICERM) Topical Workshop: Current Developments in Mathematical Fluid Dynamics: Regularity, Instabilities, and Turbulence, Providence, Rhode Island, January 24-27, 2017

Other Conferences Attended

1. Society for Industrial and Applied Mathematicians Conference on Mathematical Aspects of Materials Science, Philadelphia, Pennsylvania, June 9-12, 2013; supported by Providence College 'Summer Scholar' grant
2. Northeastern Section of the Mathematical Association of America meeting held at Providence College, Providence, Rhode Island, November 19-20, 2010
3. Northeastern Section of the Mathematical Association of America meeting held at Fairfield University, Fairfield Connecticut May 29-30, 2009

Referee & Review Work

1. Communications Faculty of Sciences University of Ankara Series A1 Mathematics and Statistics
2. "STEM textbooks" published by Elsevier Education
3. Rocky Mountain Journal of Mathematics, publisher: Rocky Mountain Mathematics Consortium
4. Discrete & Continuous Dynamical Systems Series A, publisher: American Institute of Mathematical Sciences
5. zbMATH (formally Zentralblatt MATH), a reviewing service for mathematics literature, Produced by European Mathematical Society, FIZ Karlsruhe, and the Heidelberg Academy of Sciences

6. Mathematical Modelling and Analysis, publisher: Taylor and Francis
7. Differential Equations and Dynamical Systems, publisher: Springer Verlag
8. Acta Mathematicae Applicatae Sinica (English Series), publisher: Zhongguo shu xue hui, Springer Verlag
9. Mathematical Reviews, a database of reviewed mathematical literature, published by the American Mathematical Society

Professional Memberships

- Society for Industrial and Applied Mathematics, since 2010
- American Mathematical Society, since 2001

Professional Activities

Service to the Discipline

- Chair of Parallel Session 7, "Nonlinear Evolution Equations and Related Topics", 11th American Institute of Mathematical Sciences Conference on Dynamical Systems, Differential Equations and Applications, Orlando, Florida, July 1-5, 2016
- Chair of the Contributed Paper session "Reaction-Diffusion Systems, Nonlocal Equations, and Pattern Formation – Part I", at the Society for Industrial and Applied Mathematics meeting "PD13", Analysis of Partial Differential Equations, Orlando, Florida, December 7-10, 2013
- Grader for the regional mathematics competition at Central Connecticut State University (CCSU) held April 28, 2012

Service to Providence College

- Providence College School of Business Quantitative Skills Sub-Committee, curriculum review, spring, 2015
- Advisor for SMART (Science, Mathematics and Research for Transformation) Scholarship program, fall, 2013 – summer, 2016
- Advisor for Undeclared Advising Program, summer, 2009—spring, 2013 and summer 2017—current
- Member of Faculty Senate Academic Course Review committee, fall, 2011—spring, 2012
- Academic Integrity Board, one hearing, spring, 2012
- Participation in "Family Day", April 18, 2009 and April 10, 2010

- Writing letters of recommendation for students and advisees

Service to the Department of Mathematics and Computer Science of Providence College

- Chair, Mathematics Faculty Search Committee, fall, 2017—spring, 2018
- Computer Science Faculty Search Committee, fall, 2017—spring, 2018
- Participation in student course articulation, summer 2017—current
- Department representative for ESTEEM graduate program with Notre Dame University, November 2016-currently
- Various Tenure and Promotion Committees, since fall 2014
- Helped revise Continuous Improvement Program "Self Study" document, spring, 2015
- Organized three students to participate in the Consortium for Mathematics and its Applications Mathematics Contest in Modeling contest held February 6-10, 2014
- Organized three students to participate in the Consortium for Mathematics and its Applications Mathematics Contest in Modeling contest held January 31-February 4, 2013
- Computer Science Faculty Search Committee, fall, 2012—spring, 2013
- Department Faculty Senate representative, fall, 2011—spring, 2012
- Member of Hiring Committee, coordinate responses to the College's Mission Statement, participate in discussions and phone interviews, fall 2011—spring 2012
- Creator and editor of "Students' Newsletter," (issued February 1, 2012; September 17, 2012; February 4, 2013)
- Organized two Providence College students to attend a regional mathematics competition at Central Connecticut State University held April 28, 2012
- Author of a new course proposal: MTH 311 Dynamical Systems and Chaos, last piloted in fall, 2011
- Participation in Major-Minor Fair, October 26, 2011
- Organized three Providence College students to attend a regional mathematics competition at Central Connecticut State University held April 9, 2011
- Organized six students to participate in the Consortium for Mathematics and its Applications Mathematics Contest in Modeling contest held February 10-14, 2011
- Service to Capstone Course Committee fall, 2010
- Obtained partial travel funding for an independent study student to present her work at the Thirteenth Annual Nebraska Conference for Undergraduate Women in Mathematics, fall, 2010
- Service to Local Arrangements Committee for the fall meeting of the Northeastern Section of the Mathematical Association of America meeting held at Providence College, November 19-20, 2010
- Participation in the Mathematics and Computer Science Department Colloquium, October 20, 2010 and September 28, 2011
- Advisor for fifteen mathematics majors since fall, 2009

- Service to Assessment Committee, summer, 2009

Service within the Department of Mathematical Sciences of the University of Wisconsin – Milwaukee

- Administering ALEKS (web-oriented) assignments and exams
- Proctoring for fellow instructors and faculty
- Writing student feedback evaluations
- Providing accommodations for a special needs student
- Writing three letters of recommendation
- Holding office hours

Professional Skills

- I am familiar with Mac OS X, Linux and Windows operating systems.
- I have a working knowledge of the symbolic programming package *Mathematica* for research and teaching purposes. Students in some of my introductory courses are introduced to the software as an illustrative tool. Students in upper-level courses are expected to run more complicated tool from *Mathematica* (e.g. 3D plots, numerical integration and Fourier series) as a part of their homework.
- Also, I have instructional knowledge of the *Python* programming language for the purposes of teaching CSC/MTH 440 Numerical Analysis. I am also familiar with some *MatLab* routines.
- I am familiar with the *LaTeX* typesetting software for writing various mathematical documents ranging from exams to research articles.